

April 27, 2001

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop P1-137  
Washington, DC 20555-0001

ULNRC-04166



Gentlemen:

**DOCKET NUMBER 50-483**  
**UNION ELECTRIC CO.**  
**LICENSEE EVENT REPORT 2001-003-00**  
**Reactor Trip due to Loss of both Rod Drive Motor Generators.**

---

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(iv)(A) to report an event that resulted in automatic actuations of the Reactor Protection System and the Auxiliary Feedwater System. This is characterized by the loss of electrical power to the Rod Control System during work on the Rod Drive Motor Generators and the subsequent insertion of all shutdown and control rods.

*Warren A. Witt*  
Warren A. Witt  
Manager, Callaway Plant

*WAW/jer*  
WAW/jer

Enclosure

*IE22*

cc: Mr. Ellis W. Merschoff  
Regional Administrator  
U.S. Nuclear Regulatory Commission  
Region IV  
611 Ryan Plaza Drive, Suite 400  
Arlington, TX 76011-8064

Senior Resident Inspector  
Callaway Resident Office  
U.S. Nuclear Regulatory Commission  
8201 NRC Road  
Steedman, MO 65077

Mr. Jack N. Donohew (2 copies)  
Licensing Project Manager, Callaway Plant  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Mail Stop 7E1  
Washington, DC 20555-2738

Manager, Electric Department  
Missouri Public Service Commission  
PO Box 360  
Jefferson City, MO 65102

Mr. Thomas A. Baxter  
Shaw, Pittman, Potts & Trowbridge  
2300 N. Street N.W.  
Washington, DC 20037

Records Center  
Institute of Nuclear Power Operations  
700 Galleria Parkway  
Atlanta, GA 30339

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)

Callaway Plant Unit 1

DOCKET NUMBER (2)

05000

PAGE (3)

1 OF 4

TITLE (4)

Reactor Trip due to Loss of both Rod Drive Motor Generators.

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	9	01	2001	003	00	04	27	01	FACILITY NAME	DOCKET NUMBER
										05000
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)							
POWER LEVEL (10)		100	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)	
			20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)	
			20.2203(a)(1)		50.36(c)(1)(i)(A)		X 50.73(a)(2)(iv)(A)		73.71(a)(4)	
			20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)	
			20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)			
			20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)			
			20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)			
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)			
			20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)			

## LICENSEE CONTACT FOR THIS LER (12)

NAME M. A. Reidmeyer, Supervisor, Regional Regulatory Affairs

TELEPHONE NUMBER (Include Area Code)

(573)676-4306

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	JD	MG	E120	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO						

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

At 1252, 3/9/01, with the Plant in Mode 1 at 100 percent Reactor Power, after opening the output breaker for 'B' Rod Drive Motor Generator (RDMG) in preparation for maintenance, the output breaker for 'A' RDMG opened. This de-energized the Rod Control System and caused all rods to insert into the Reactor (Rx) core. As a result of the rod insertion, primary temperature and pressure decreased and caused an OTdeltaT Rx trip to occur which opened both Rx Trip breakers. All systems operated as expected except for rod K-10 which had a faulty indication. The primary was borated an additional 150 ppm. Troubleshooting found a faulty circuit card which when replaced, corrected the K-10 indication problem. Plant startup and return to service was delayed by equipment problems with 'B' Main Feedwater Regulating Valve. After completion of repairs, the Plant returned to service on 3/13/01. The cause of the RDMG output breaker opening has been traced to a 40-volt ripple, which caused an over voltage condition to be sensed. The 40-volt ripple vanished the day after the trip and its source has not been determined.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		2001	- 003	- 00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

**I. DESCRIPTION OF THE REPORTABLE EVENT**

**A. REPORTABLE EVENT CLASSIFICATION**

This Licensee Event Report is submitted because of an incident that resulted in the automatic actuations of the Reactor Protection System (RPS) and the Auxiliary Feedwater System per 10CFR50.73(a)(2)(iv). It is characterized by all control and shutdown rods inserting into the Reactor core due to a loss of RDMG output due to an electrical malfunction. This event was classified as an 8-hour Report because the RPS Actuation occurred after the Reactor was shutdown as indicated by rods being on the bottom. This is supported by the following information:

- A Licensed Operator (LO) observed the rods drop into the core and stated that all rods were on the bottom before the Rx Trip breakers opened.
- Computer generated printouts document that an RPI ROD ON BOTTOM INDICATION alarm was generated prior to the RX MAIN TRIP BKR B and RX MAIN TRIP BKR A tripped alarms occurring.

**B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT**

On 3/9/01, when this event occurred, the Callaway Plant was in Mode 1 operating at 100 percent Reactor power.

**C. STATUS OF STRUCTURES, SYSTEMS OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT**

'B' RDMG had just been removed from service when the output breaker for 'A' RDMG opened.

**D. NARATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES**

On 3/9/01, a decision was made to work on 'B' RDMG due to voltage control problems. With both 'A' and 'B' RDMGs running, each machine had 30 amps electrical load. At approximately 1252, the 'B' RDMG output breaker was opened by a Non Licensed Operator (NLO) in preparation for a preplanned maintenance activity, and it was observed that the 'A' RDMG assumed the load as indicated by output current increasing from 30 amps to 60 amps. The 'A' RDMG set remained loaded for approximately 10 seconds before its output breaker opened and de-energized the Rod Control System. With the Rod Control system de-energized, all rods inserted into the core without a Reactor Protective System (RPS) actuation. As a result of all rods inserting, reactor coolant temperature and pressure decreased, which caused an OTdeltaT reactor trip to be generated and open both Reactor (Rx) Trip breakers. All safety systems actuated as expected, including Feedwater Isolation, Auxiliary Feedwater actuation, and Steam Generator (S/G) Blowdown Isolation. As a result of the Auxiliary Feedwater actuation, the Turbine Driven Auxiliary Feed Pump (TDAFP) started and a small amount of radioactivity was released through the TDAFP Turbine. The release was insignificant compared to the regulatory limits.

During the event, the Control Room observed a General Warning alarm and erroneous indication on rod K-10. The reactor coolant system was borated an additional 150 ppm per procedure as a conservative reactivity management action. Subsequent troubleshooting determined the problem to be a faulty circuit card which was replaced and the faulty K-10 rod position indication was corrected.

On 3/11/01, during Plant start-up, a problem was discovered with 'B' Main Feedwater Regulating Valve (MFRV). The repairs necessary to return this valve to service extended the outage and necessitated notifying the Missouri Public Service Commission (MPSC) of an outage lasting longer than 72 hours, both verbally and in a written follow-up report. The notification made to the MPSC in turn required a 4-hour notification be made to the Nuclear Regulatory Commission (NRC) per 10CFR50.72(b)(2)(xi) and was an update to event number 37821.

On 3/13/01, the plant was returned to full service and commenced power production at 1350.

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3      O F      4
		2001	-      003	-      00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

## E. METHOD OF DISCOVERY OF EACH COMPONENT, SYSTEM FAILURE, OR PROCEDURAL ERROR

On 2/27/01, 'B' RDMG output breaker tripped. Subsequent troubleshooting identified a problem with the voltage regulator and it was replaced on 2/28/01. After the new regulator was installed, 'B' RDMG output voltage exhibited minimal oscillation which was considered to be within normal tolerances.

On 3/7/01, while cross-tying electrical busses PK01 and PK02, an 'A' MG SET TROUBLE alarm and KC (fire protection system) alarms were received. This is not an uncommon alarm scenario when cross tying busses. Note: PK01 feeds PK51, which feeds the 'A' RDMG cubicle, and PK02 feeds PK52, which feeds the 'B' RDMG cubicle. Both PK51 and PK52 feed KC alarms. The RDMG cubicles contain DC control power, field flashing, breaker control power, and the respective voltage regulators. After the Reactor Trip, subsequent troubleshooting revealed that the problems on PK01 and PK02 were related to a 40-volt ripple that was induced onto bus PK02 by an unknown source.

The actual securing of 'B' RDMG was done in a controlled manner by a knowledgeable NLO, and no problems or Human Performance issues were experienced.

II. EVENT DRIVEN INFORMATION

## A. SAFETY SYSTEMS THAT RESPONDED

All required safety systems responded normally.

## B. DURATION OF SAFETY SYSTEM INOPERABILITY

Not applicable. There were no safety systems rendered Inoperable as a result of this event.

## C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT.

A probabilistic risk assessment (PRA) was conducted to evaluate the reactor trip and resulting plant response to the transient, which was induced by the loss of both rod drive motor generators. The PRA took into account the plant conditions immediately following the event and is considered to be a reasonable estimate of the conditional probability of core damage (or conditional core damage probability, CCDP). The PRA determined that this event, a reactor trip with main feedwater potentially available, resulted in a CCDP of 1.3E-07. The event was not risk significant with respect to the health and safety of the public.

III. CAUSE OF THE EVENT

On 3/10/01, the cause of the RDMG output breakers tripping was determined to be a 40-volt ripple being induced by an AC circuit on the PK02 DC bus. On 3/7/01, PK01 and PK02 buses were cross-tied and the ripple on PK02 was now feeding both RDMG sets' voltage control regulators and causing them to oscillate more than normal. The oscillation then led to the 'A' RDMG output breaker tripping on over-voltage. During the night of 3/10/01, the 40-volt ripple vanished. An intensive investigation has been conducted to try and determine the source of the ripple, but it has not been identified as of the writing of this LER.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4      O F      4
		2001	- 003	- 00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

**IV. CORRECTIVE ACTIONS**

Preliminary corrective actions included the inspection and adjustment, as required, of 'A' and 'B' RDMG output breakers. Additional investigations will be conducted during Refuel 11.

**V. PREVIOUS SIMILAR EVENTS**

A review of the past three years of Callaway Action Request System documents and Licensee Event Reports did not reveal any similar occurrences involving a loss of electrical power to the Rod Control System.

**VI. ADDITIONAL INFORMATION**

The system and component codes listed below are from the IEEE Standard 805-1984 and IEEE Standard 803A-1984 respectively.

System:              JD

Component:        MG